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UD Engineering Students Partner with Industry to Design Low-Cost General Aviation Aircraft of the Future

University of Dayton

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NEWS RELEASE

(Editor's Note: Engineering students designing a small airplane will present their recommendations to their sponsor at 8 a.m. on Wednesday, Dec. 4, in room 140 in Kettering Laboratories on campus. Available digital photos include students testing a composite beam.)

UD ENGINEERING STUDENTS PARTNER WITH INDUSTRY TO DESIGN LOW-COST GENERAL AVIATION AIRCRAFT OF THE FUTURE

DAYTON, Ohio — As they wind their way along back roads in rural southwestern Ohio, four University of Dayton mechanical engineering students shift uncomfortably in their seats and talk about the thrust an F-16 needs to break the sound barrier.

It's fitting that they're crammed into the back seats of a professor's minivan as they roll through the quiet farmland made brilliant by autumn colors. In half an hour, they'll be updating a sponsor on their designs for an airplane cargo area not much bigger than the space they're in.

The sponsor is Jeff Banks of the Banks Co., Inc., a regional distributor of industrial X-ray film. Banks is also a private pilot with what he thinks is an idea that could revolutionize small aircraft design and put Dayton and southwest Ohio right in the middle of a renaissance in the small aircraft aviation industry. He's turned to UD engineering students for help getting it off the ground.

Nate Miller, Aaron Pahs, Lee Riehl and Tim Stover have spent the last six weeks stressing beams of composite materials, constructing computer models and testing designs to see whether modern composites can breathe life into 60-year-old small aircraft technology. Their feasibility study will help Banks determine whether a new composite material, a fiber-glass pultrusion, is strong enough — and cost effective — to use in the frame of a small plane about 50 percent larger than the DeHavilland Beaver, and they'll recommend the best design.

The students are part of the School of Engineering's Design and Manufacturing Clinic. The clinic facilitates partnerships between upper-level UD students and business and industry sponsors. Sponsors provide a real-world engineering project for the students' capstone course, and the students provide answers, solutions and expertise.

It's different than a co-op experience, during which students work under a professional's supervision for months at a time. At the clinic, students are their own supervisors, defining the

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project, results and deliverables in conjunction with the sponsor and faculty advisers. They take a project from start to finish and learn how to work as a team to solve problems. Their 17 projects this semester include concepts and designs for a new portable compressor and improvements to a new carpet-cleaning machine.

"Our students don't come to the projects with preconceptions about how things have always been done," said Phil Doepker, coordinator of the clinic. "We encourage them to come up with unique ideas for ways to solve the engineering problems they're presented."

Turning to UD engineering students for solutions was an obvious choice, Banks said. "For a very reasonable cost I can get a lot accomplished. It's good for us and good for them."

Banks thinks the market for the plane the students are helping develop will be strong in places like Alaska and in developing countries, where low-cost aviation can bring huge benefits. He believes that with the right shepherding, his idea could turn southwest Ohio back into a center of general aviation manufacturing.

"We have on our license plates 'Ohio birthplace of aviation,' but in many ways it was a still birth," he said. "We let general aviation leave the state of Ohio. The time is perfect for a rebirth."

The students come away from their meeting with Banks with a clear message: It's time to "break stuff," something Miller has been waiting to do since the team first got the project. Back at Kettering Labs on campus, they gather in front of the Instron, a very large but precise tool for testing a material's strength, tension and compression. Miller places a 12-inch beam on two supports roughly 10 inches apart. He then lowers two more contact points, roughly four inches apart, from the top. Between all of the contact points, Miller and Doepker have added shims to distribute the load and lower stress concentrations.

Their goal is to learn how the composite reacts to forces and when it will break. Miller begins the process by lowering the upper contact points, exerting force on the beam. As Miller monitors the rising forces, Pahs takes readings from a strain gauge meter that measures the amount of tension and compression in the beam. Riehl records these as the beam withstands higher and higher forces. When it finally gives way, the beam has held up under forces more than twice as strong as what they anticipated.

Hands-on experiences like this test "give students valuable industry experience before they go to work," says faculty adviser Aaron Altman. "The projects have no unique, closed-form solutions. It's often the first time that students are given a problem to solve for which there is no single solution or even no solution at all. ... It's the closest you're ever going to get in an academic environment to what happens in industry."

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